of winged male insects, and here some species are prone to produce more than others. When the season is rainy or humid, at the time of fertilization, the generation issuing would contain winged males in the majority and some of these larvae will transform later into crown shaped cells. Thus the crown shaped cell was recognized by me in 1923, and unwittingly by Chamberlin (Mahdihssan 1923) independently about the same time. In an article, appearing in this *Journal* (Mahdihassan 1948) to which Ganguly and Varshney also refer, I offered evidence to show the same was unwittingly illustrated in the earliest illustration of lac, dated 1567, for which credit goes to C. Clusius. I have traced the history of this illustration. Garcia sent no illustration nor any specimen of lac to Clusius. The latter had some collected from the market in Europe and illustrated as three samples. At any rate the additional photographs of encrustations I have offered (Mahdihassan 1948) do support the presence precisely at the end of an encrustation of a crown shaped cell seen in the wood-cut of 1567.

Every species of lac produces winged males. Some species produce such males in excess. Their larvae, when isolated, tend to reverse their sex and produce single hexagonal and crown shaped cells. It was first recorded in 1923, fully illustrated in 1930, and an old illustration of 1567 was interpreted, in 1948, as showing the same. The crown shaped cell is to be traced to an *insect species and not to any host plant.*

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30. THE BLACK ANT, *CAMPONOTUS* SP. FEEDING ON UREA

In a new suburb of Karachi which was barren land some ten years ago, there is now a well established plant nursery, hedged by two thorny trees, *Spicigera juliflora*, a New World plant, now domiciled, and *Acacia arabica*. Both are about fifteen feet high and their lower branches are heavily infested with colonies of the membracid, *Oxyrhachis taranda*, in turn visited by the black ant, *Camponotus compressus*. The excreta of the membracid is "honey dew", on which the ant feeds. Along the adjoining roads *Dipterocarpus sisoo* are planted as avenue trees, many of which have, at their base, a nest of the above ant. The tree is attacked by another membracid identified as, *Gargara mixta,* whose honey dew also attracts the ant. In this case however the membracid has to be searched for, as they are few in contrast to the heavy population of *O. taranda.* In a garden, just opposite the nursery, there is an *Anona squamosa* tree, bearing encrustations of the lac insect, *Kerria sindica.* Its excreta, or "honey dew", also feeds the ant. However there is a marked difference in the appearance of host plants on which lac was growing and those which supported the membracid, *Oxyrhachis taranda.* In Karachi both these insects can thrive well on *Acacia arabica* so the nature of the host plant would remain the same. The foliage of trees bearing lac appeared sooty. This was traced to drops of "honey dew" of lac insects falling on the branches below. Enough honey-dew could be collected and analysis showed the presence of glucose and fructose. These sugars having fallen on leaves produced the growth of the saprophytic black fungus, *Aspergillus niger.* The trees bearing thick colonies of *O. ternata* membracid, on the other hand, showed normal clean foliage. Its honey dew could not be collected enough for analytical purpose. The absence of any such growth of *Aspergillus* indirectly suggested the absence of sugars in the liquid excreta of the membracid.

In the above city suburb there was an open ground where some nomads had pitched tents and were using open-air latrines. The *Camponotus* ant was found feeding on human urine. It was further established that the ant was a regular visitor to urinals in the neighbouring houses. This suggested that the ant must be feeding on urea and further that urea must be a constituent of the "honey dew" of the membracid. Ammonia is the degradation product of animal protein metabolism but there is proper provision for ammonia to be synthesized into harmless urea which, in the case of man, is undertaken by the liver. In the case of insects Malpiglian tubes seem to play this role. At any rate the fact first to be established was whether *Camponotus* does feed on urea.

Some urea powder was dropped near a nest of *Camponotus* ants but the reaction was not very decisive. Finally a solution of carboxy methyl cellulose, in water, was spread over a spot and urea dropped at one end so that, by the time it dissolved to reach the boundary of that spot, different degrees of urea concentration would occur. The ant was at once attracted to such urea solution. Thus there was no doubt left that *Camponotus compressus* feeds on urea, and accordingly behaves like a scavenger as far as urine is concerned. Very probably the honey dew of membracid is also rich in urea.

Extending the above observations I tried to feed the ant on cane sugar which again attracted the insect. It also took to "liquid glucose" but would not touch Glaxo's preparation "Glaxose D", which is glucose powder fortified with calcium glycerophosphate. The ant was attracted by sorbitol, speciallly 60 per cent liquid sorbitol, manufactured by Merck, Darmstadt. Surprisingly lactose, either as powder or as solution, was refused. Soft cheese but not milk, gave a positive reaction. None of the following aminoacids were acceptable, glycine which is sweet, lysine, and methionine, others were not tried. Thinking that some thing sweet would appeal, soluble saccharine was offered but the response was negative. Whereas urea was welcomed, uric acid was completely ignored.

Urea, a degradation product, to become food of an insect does require an explanation. Incidentally Schmidt-Nielsen of Duke University, U.S.A., found that "whereas most animals with lower urine output cannot urinate enough to expel waste urea the camel can recycle much of his urea through the liver to make new protein thereby keeping achead on both food and water." However it is generally the practice that if urea is added to cattle fodder it results in improving nutrition. The intestinal bacterial flora of cattle can synthesize urea into proteins and probably the same is the case with the camel. Coming to the oriental species of the genus *Camponotus* they all contain intercellular symbiotic bacteria in the intestine so that it is most likely that these can effectively synthesize urea into protein. This would at once explain how *Camponotus* species alone attend upon the colonies of the two membracids mentioned while other ants do not. Work on the isolation of the symbiotic bacteria and their role in the metabolism of the ant will be reported on later.

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31. ON THE LARVA OF *TRAMEA VIRGINIA* (RAMBUR, 1842) FROM INDIA, WITH NOTES ON THE LARVAE OF INDIAN REPRESENTATIVES OF GENUS *TRAMEA* HAGEN, 1861 (LIBELLULIDAE: ODONATA)

(*With ten text-figures*)

Larva of *Tramea virginia* Rambur is described and illustrated on the basis of material from Dehra Dun Valley, India. Notes on the larvae of Indian representatives of the genus is appended (including *basilaris burmeisteri* Kirby and *similata* Rambur).

INTRODUCTION

Genus *Tramea* Hagen, 1861, is widely spread in circumtropical region. It comprises a number of closely allied species with migratory tendencies and having almost identical type of larval habitats like lakes, perennial monsoon ponds and marshes.

Fraser (1936) recorded two representatives of the genus *Tramea* within Indian limits, namely, *T. basilaris burmeisteri* Kirby and *T. limbata* (Desjardins); *T. virginia* was recorded by him (loc. cit.) from Burma, throughout Indo-China, China and Formosa. However, recently *T. virginia* has been recorded from various Indian localities namely, Kangra, Himachal Pradesh (Prasad 1976) and Dehra Dun Valley, Uttar Pradesh (Singh & Prasad 1976). Lieftinck (1962) has discarded the specific status of *T. limbata* from E. Asia